

DESCRIPTION OF A NEW SPECIES OF BRACONIDAE,  
*MONOCTONUS ALLISONI* (HYMENOPTERA: BRACONIDAE: APHIDIINAE),  
AND DISCUSSION OF THE APHID-PARASITOID GUILD FOR *NASONOVIA*  
SPP. (HEMIPTERA: APHIDIDAE) IN NORTHWESTERN UNITED STATES

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**Abstract.**—A new species of aphid parasitoid, *Monoctonus allisoni* Pike and Starý, is described from Washington. It is found in association with *Nasonovia* (*Eokakimia*) *wahinkae* (Hottes) (Hemiptera: Aphididae) on pale larkspur, *Delphinium glaucum* Watson, in a montane forest setting. This is the first native *Monoctonus* in North America known to attack *Nasonovia* spp. A key to the parasitoid guild of *Nasonovia* is provided.

**Key Words:** aphid, parasitoid, *Monoctonus*, *Nasonovia*

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A new species of aphid parasitoid of the Braconid genus *Monoctonus* Haliday was found in Washington's Blue Mountains attacking aphids of the species *Nasonovia* (*Eokakimia*) *wahinkae* (Hottes) on pale larkspur, *Delphinium glaucum* Watson. This unusual occurrence represents the first native *Monoctonus* in North America known to attack *Nasonovia*. The parasitism was over a large colony, suggesting that the aphid was a preferred host of the parasitoid. The new species is described here. A key to the *Nasonovia* parasitoid guild for northwestern United States is provided.

#### MATERIAL AND METHODS

All aphid parasitoids were reared from field-collected aphids. The key to the *Nasonovia* parasitoid guild is based on rearings from aphid collections originating from a wide array of plants (see Pike et al. 2000), other original information of the authors, and from published records by Mack-

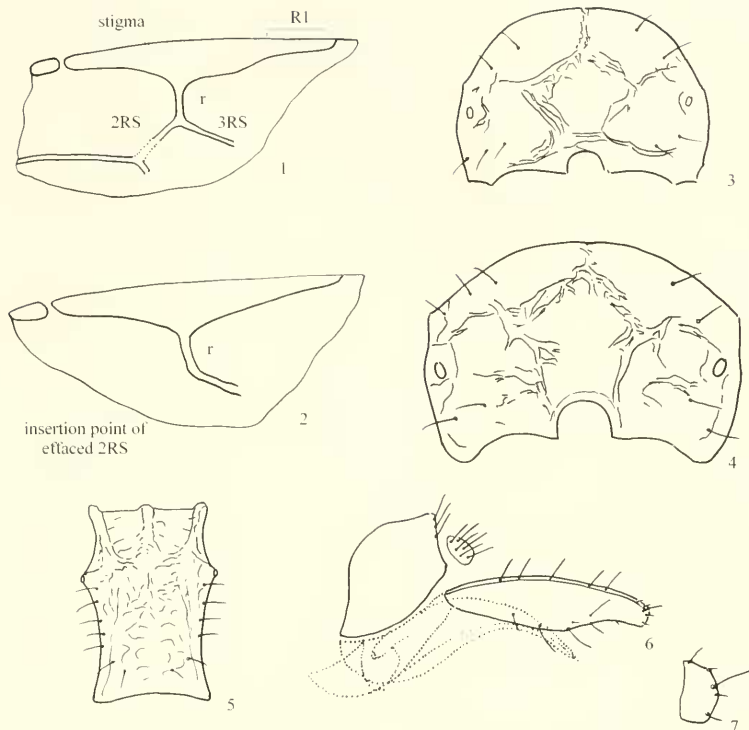
auer (1962a), Marsh (1979), and Starý and Remaudière (1977). They are also the basis for establishing and confirming tritrophic (plant-aphid-parasitoid) associations. Additionally, a broad framework of records of parasitoids of *Nasonovia* spp. from Europe [Starý (1966, 1976), Starý et al. (1971, 1973, 1977), Tizado (1992), Tizado and Nuñez Perez (1991), and original files of P. Starý] was reviewed in reference to the present studies.

Descriptive morphology characterizing *Monoctonus allisoni* follows that of Huber and Sharkey (1993), and Sharkey and Wharton (1997). Aphid nomenclature corresponds to Remaudière and Remaudière (1997).

#### DESCRIPTION

*Monoctonus allisoni* Pike and Starý,  
new species  
(Figs. 1–7)

**Diagnosis.**—The shape of the ovipositor sheath distinguishes the new species from



Figs. 1-7. *Monoctonus allisoni*, female (illustrations not to same scale). 1-2. Forewings (in part), two drawings showing variation in venation. 3-4. Propodea (dorsal view, two drawings showing variation). 5. Petiole (dorsal view). 6. Genitalia with ovipositor sheath (lateral view). 7. Ovipositor sheath apex, close-up. Abbreviations: RI = distal abscissa of post-marginal vein [= metacarpus]; r, 2RS, 3RS = wing veins.

the known Nearctic species of *Monoctonus* in which the ovipositor sheath is distinctly plough-share shaped; in *M. allisoni*, the sheath is only moderately widened ventrally. The latter character places *M. allisoni* close to *Harkeria rufa* (Cameron), but it is easily distinguished by antennal segment number: *M. allisoni* has 15-16 segments; *H. rufa* has 18-19 segments (see Discussion below).

**Etymology.**—Named in recognition of David Allison, Washington State University Research Technologist, who has contributed

significantly for many years to the research on aphid parasitoids in northwestern USA.

**Description.**—Female: **Head:** Eye medium-sized, with sparse setae. Tentorio-ocular line shorter than half of inter-tentorial line. Malar space almost twice as long as tentorio-ocular line (5:3). Maxillary palpus 4-, labial palpus 3-segmented. Antenna 15-16 segmented, filiform. Flagellomere 1 (F1) three times as long as wide, setae somewhat longer than half its width, without longitudinal placodes. Flagellomere 2 subequal to F1, with one placode. Medial to apical fla-

gellomeres only  $\frac{1}{4}$  wider than F1, antenna not thickened toward apex.

*Mesosoma*: Mesonotum smooth, with sparse long setae along sides. Notauli distinct in ascendant portion only.

*Forewing* (Figs. 1–2): Stigma about 5 times as long as broad. Metacarpus (R1) short, equal to about  $\frac{1}{4}$  stigma width. Radial abscissa (r) slightly longer than half of 3RS. 2RS sometimes effaced or rather colorless in basal portion. M+m-cu often colorless; stigma, metacarpus (R1), r, and 3RS well-pigmented and distinct.

*Propodeum* (Figs. 3–4): Distinctly areolated, pentagonal areola complete in spite of some variation due to rugosities in upper portion.

*Metasoma*: Petiole (Fig. 5) about twice as long as wide at apex; width at spiracles  $\frac{1}{2}$  shorter than segment length; spiracular tubercles prominent laterally, situated at end of basal third, surface feebly rugose, with indications of longitudinal carinae along sides and with 4–5 long setae along sides in middle and apical third.

*Genitalia*: Ovipositor sheath (Fig. 6–7) slightly arcuate and only moderately widened ventrally.

*Coloration*: Generally bicolorous. Head brown, face and lower third yellow. Mandible with brown apices. Palpi yellow. Antenna brown, scape and pedicel light brown with yellow markings. Mesosoma with mesonotum brown, sometimes scutellum and propodeum somewhat darkened, remainder yellow. Tegula brown. Wing venation light brown. Legs yellow. Metasoma with basal and apical areas yellow, brown in middle. Petiole basally yellow, remainder more or less brown. Ovipositor sheath yellow.

*Body length*: 2.0–2.2 mm.

Male. Antenna 17–18 segmented. Coloration generally bicolorous to prevalently brown. Head prevalently brown with clypeus, lower part of gena, mandible and palpi light brown. Antenna brown, apex of pedicel with yellow ring. Mesosoma brown with yellow markings, mesonotum brown. Wing venation light brown. Legs yellow to

largely yellow brown. Metasoma brown, except more or less yellow base.

*Material*.—Holotype ♀, reared from *Nasonovia* (*Eokakimia*) *wahinkae* (Hottes), USA, Washington, Columbia County, Bluewood Ski Resort, 17-IX-2001, on *Delphinium glaucum*, sample coded AIG342, coll. G. Graf. Paratypes (same data as holotype), dry mounted 7 (1 ♀, 6 ♂) slide mounted 13 (8 ♀, 5 ♂). Holotype deposited in National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C. Paratypes deposited in USNM (2 ♀, 2 ♂), Washington State University-Prosser (4 ♀, 3 ♂), and collection of P. Starý in České Budějovice (3 ♀, 6 ♂).

#### PARASITOID GUILD OF *NASONOVIA* SPP. IN NORTHWESTERN UNITED STATES

The following species-guilds were analyzed: *Nasonovia* (*Kakimia*) *alpina* (Gillette & Palmer), *N. (K.) aquilegiae* (Essig), *N. (Capitosiphon) crenicornis* (Smith & Knowlton), *N. (K.) cynosbati* (Oestl.), *N. (K.) houghtonensis* (Troop), *N. (K.) polemonii* (Gillette & Palmer), *N. (Nasonovia) ribisnigri* (Mosley), *N. (Eokakimia) wahinkae* (Hottes), and unidentified *Nasonovia* spp. Most of the *Nasonovia* parasitoid guild members (*Aphidius polygonaphis* Fitch, *Ephedrus californicus* Baker, *Lysiphlebus testaceipes* (Cresson), *Praon occidentale* Baker, *P. humulaphidis* Ashmead, *P. unicum* (Smith) are more or less broadly oligophagous species across various aphid genera (Pike et al. 2000). *Aphidius kakimiaphidis* Smith, is the most common parasitoid of *Nasonovia*, although it does not attack all species in the genus. The new species, *Monoctonus allisoni*, is currently known to attack only a single aphid species, *Nasonovia* (*Eokakimia*) *wahinkae*.

*Nasonovia ribisnigri*, a European aphid now widespread in North America, has a parasitoid guild of native broad oligophages (*Ephedrus californicus*, *Praon humulaphidis*, and *P. unicum*), and an introduced European parasitoid, *Monoctonus crepidis* (Haliday) (recognized in Canada and parts

of the USA, see Mackauer 1962a, Marsh 1979; also see discussion below). Interestingly, this aphid is not attacked by the common native *Nasonovia*-attacking parasitoid, *Aphidius kakimiaphidis*.

KEY TO THE PARASITIDS OF *NASONOVIA* IN NORTHWESTERN UNITED STATES

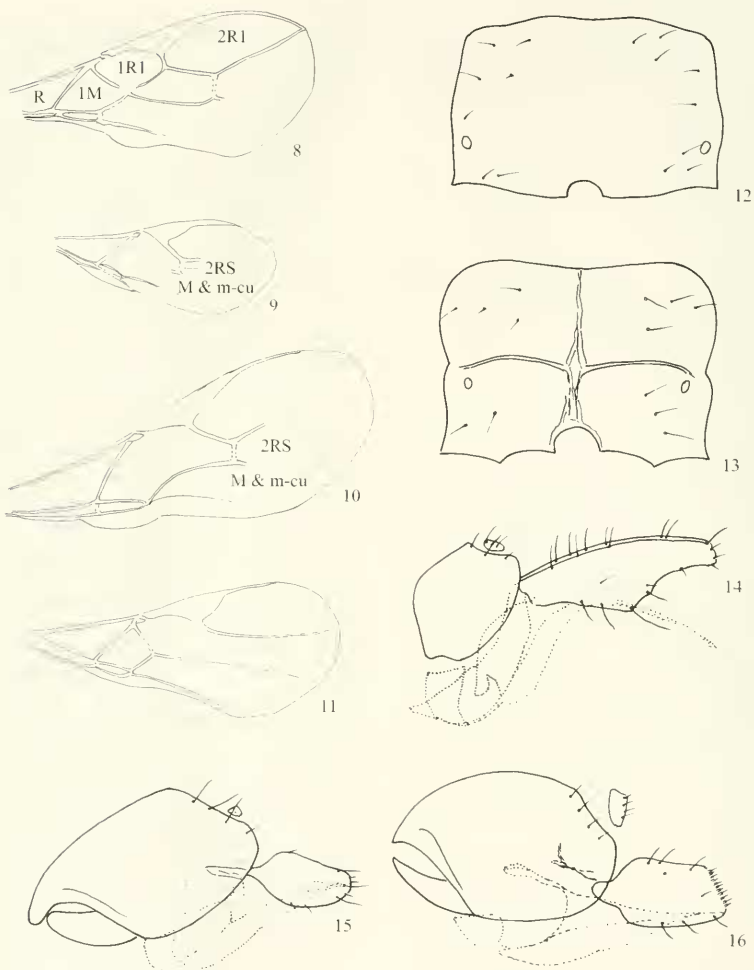
- 1. Forewing with four enclosed cells along anterior margin (R, M1, 1R1, 2R1) (Fig. 8)
  - ..... *Ephedrus californicus* (Baker)
  - Forewing with less than 4 enclosed cells along anterior margin ..... 2
- 2(1). Forewing with vein r perpendicular or almost perpendicular to stigma (Figs. 1-2); ovipositor sheath arcuate, curved downward (Figs. 6, 14) (*Monoctonus*) ..... 3
  - Forewing with vein r not perpendicular to stigma; ovipositor sheath curved slightly upward (Figs. 15-16) ..... 4
- 3(2). Ovipositor sheath plough-share shaped (Fig. 14). Antenna 14-15 segmented .....
  - ..... *Monoctonus crepidis* (Haliday)
  - = Ovipositor sheaths only gradually widened ventrally (Fig. 6). Antenna 15-16 segmented .....
    - ..... *Monoctonus allisoni* Pike and Starý, n. sp.
- 4(2). Forewing with vein 2RS absent (Fig. 11) (*Praon*) ..... 5
  - Forewing with vein 2RS present (Figs. 9, 10) ..... 7
- 5(4). Flagellomere 1 dark. Mesosoma unicolorous, uniformly dark ..... 6
  - Flagellomere 1 testaceous. Mesosoma distinctly bicolorous, more or less lighter in lower part. Antenna 17-20 segmented .....
    - ..... *Praon humulaphidis* Ashmead
- 6(5). Antenna 17-18 segmented .....
  - ..... *Praon occidentale* Baker
  - Antenna 14-16 segmented .....
    - ..... *Praon unicum* Smith
- 7(4). Forewing with vein M & m-cu incomplete (Fig. 9). Propodeum smooth (Fig. 12) .....
  - ..... *Lysiphlebus testaceipes* (Cresson)
  - Forewing with vein M & m-cu complete (Fig. 10). Propodeum areolated (Fig. 13) (*Aphidius*) ..... 8
- 8(7). Antenna 13-14 segmented .....
  - ..... *Aphidius kakimiaphidis* Smith
  - Antenna 17-19 segmented .....
    - ..... *Aphidius polygonaphis* (Fitch)

DISCUSSION

Taxonomy of *Monoctonus allisoni*.—The combination of several key characters of *M.*

*allisoni* position it between *Monoctonus* and *Harkeria* Cameron (*sensu* van Achterberg 1989). *Harkeria rufa* Cameron (specimens from Finland and from northwestern United States examined by P. Starý) have relatively distinct pentagonal areola on the propodeum, and a typical narrow petiole without prominent spiracular tubercles, whereas *Paramonoctonus* Starý (see Starý 1959) which was synonymized with *Harkeria* by van Achterberg (1989), lack the complete areola, i.e., have merely lower divergent carinae. This suggests a need for full re-evaluation and reclassification of *Monoctonus*, *Harkeria* and *Paramonoctonus* (possibly *Boreogalba* Mackauer, mentioned below)

In *Monoctonus allisoni*, the propodeum is distinctly areolated, in spite of some variation in size and sculpture (Figs. 3-4) due to less defined carinae among the rugae. *Monoctonus allisoni* has the maxillary palpi 4- and labial palpi 3-segmented (*M. crepidis* has the same characters), whereas 4- and 2 are defined for *Harkeria* and *Monoctonus* by van Achterberg (1989). The ovipositor sheath in *M. allisoni* is quite similar to *H. rufa*, opposite to the plough-share shaped characteristic of *M. crepidis* (Mackauer 1962a) and other species in northwestern United States (Pike et al. 2000). The forewing venation in *M. allisoni* is typical of *Monoctonus*, although some specimens have a strong reduction in vein pigmentation with merely the radial abscissa present (Fig. 2). A similar variation is known for *Harkeria* (= *Paramonoctonus*) *angustivalva* (Starý) in Europe (Starý 1959). The combination of characters for *M. allisoni* of wing venation (variation, reduction), areolated propodeum, and shape of the petiole and ovipositor sheaths, point to some likeness with the monotypic genus *Boreogalba* Mackauer (*B. gladifer* Mackauer, host unknown, see Mackauer 1962b, Mackauer and Starý 1967), but other characters differ widely, e.g., shape of the propodeum (*B. gladifer* squarish, *M. allisoni* anteriorly rounded) and number of antennal segments



Figs. 8-16. Various features of parasitoids attacking *Nasonovia* aphids (illustrations not to same scale). 8-11. Forewings. 8, *Ephedrus californicus*. 9, *Lysiphlebus testaceipes*. 10, *Aphidius polygonaphis*. 11, *Praon occidentale*. 12-13. Propodea. 12, *L. testaceipes*. 13, *A. polygonaphis*. 14-16. Genitalia. 14, *Monoctonus crepidis*. 15, *L. testaceipes*. 16, *A. polygonaphis*.

(*B. gladifer* 11 segments; *M. allisoni* 15–16 segments).

*Monoctonus crepidis* in North America.—*Monoctonus crepidis* (Haliday), a species broadly distributed in Europe, was detected on *Nasonovia ribisnigri* in Canada by Mackauer (1962a) (also reported by Marsh 1979). It was presumed introduced into North America from Europe via ship-transported plants with parasitized aphids. Evidence points to its establishment in North America in about 1953 in southeastern Québec. In 1977, Starý and Remaudière (1977) further recognized its presence on *N. ribisnigri* in Québec and its outward spread in North America. Although not confirmed in northwestern United States, we expect it will become part of the *Nasonovia* parasitoid guild; thus, it is included in the preceding key.

*Harkeria rufa* and *Nasonovia houghtonensis*.—This association was presented by Pike et al. (2000), but, after careful checking of the original labeled material, it was determined *Macrosiphum osmaroniae* was the correct host, instead of *Nasonovia houghtonensis*. Thus, *Harkeria rufa* is not recognized here as part of the *Nasonovia*-parasitoid guild.

*Nasonovia*-parasitoid guilds in Europe and North America.—In Europe, the known *Nasonovia* species attacked by parasitoids are: *Nasonovia* (*Kakimia*) *brachycyclica* Holman, *N. (Kakimia) dasyphylli* Stroyan, *N. (Nasonovia) nigra* Hille Ris Lambers, *N. (Nasonovia) pilosellae* Boerner, *N. (Nasonovia) ribisnigri* (Mosley), *N. (Kakimia) saxifragae* Stroyan, and some unidentified species. The typical or common parasitoid guild for *Nasonovia* are *Aphidius hieraciorum* Starý, *Harkeria angustivalva* (Starý), *Monoctonus crepidis* (Haliday), and *Praon pubescens* Starý. These are almost all uniformly oligophagous on *Nasonovia* species. On rare occasion, the common guild is supplemented by *Aphidius ervi* Haliday, *A. picipes* (Nees), *Ephedrus cerasicola* Starý, *E. persicae* Froggatt, and *E. plagiator* (Nees). Also included in the guild

is *Monoctonus hispanicus* Tizado, which apparently attacks only species in the subgenus *Kakimia*.

Certain aphid-plant combinations may play a part in the parasitoid guild composition for a given area. *Aphidius hieraciorum* and *Praon pubescens* parasitize *Nasonovia* on both its primary (*Ribes*) and secondary (*Hieracium*) hosts. In contrast, *Harkeria angustivalva* and *Monoctonus crepidis* (Mackauer 1962a) attack *Nasonovia* only on *Hieracium*. Populations of *Aphidius ervi*, *A. picipes*, and *Ephedrus plagiator*, usually uncommon on *Nasonovia*, may increase depending upon proximity and type of other suitable aphids immediately present or nearby.

In reviewing *Nasonovia* guilds in Europe and in North America, some basic phenomena are evident. (1) The European guild manifests more *Nasonovia*-specific oligophagous parasitoids than the North American guild, even though each continent has prevalently native aphid species. (2) The host range analysis of the aphidid guilds manifests four groups (Starý 1981): a) species-specific parasitoids, which are rare (possibly *Monoctonus hispanicus*); b) oligophages specific to *Nasonovia* (examples: *Aphidius hieraciorum*, *A. kakimiaphidis*, *Harkeria angustivalva*, and *Praon pubescens*); c) oligophages specific to *Nasonovia* and closely related groups (examples: *Monoctonus crepidis* on *Nasonovia*, and *Hyperomyzus* [the latter genus is closely associated with *Nasonovia*, see Hille Ris Lambers 1949, Heie 1979, Footitt and Richards 1993]); and d) broadly oligophagous, or "sweeper" species.

Economic significance of *Nasonovia*.—A majority of the *Nasonovia* spp. (43 recognized, Remaudière and Remaudière 1997) reside in meadows and forest undergrowth from lowlands to high mountains, with some species adapted to urban parks and gardens where suitable hosts exist. Most of these are of little or no economic importance. Most are uncommon and the parasitoid associations are unknown. There are, however, four species, *Nasonovia brachy-*

*cyclica* Holman, *N. cynosbati* (Oestlund), *N. houghtonensis* (Troop), and *N. ribisnigri* (Mosley), which at times are pestiferous on *Ribes* spp. (gooseberries and currants). The latter species also is recognized to feed on lettuce and other herbaceous plants. The aphids feeding on *Ribes* commonly cause retardation and a curling and twisting of terminal growth and leaves (Blackman and Eastop 1984).

The distribution of the economic or potentially economic species is as follows: *N. brachycyclica*, Czech Republic (Holman 1972); *N. cynosbati* and *N. houghtonensis*: North America; and *N. ribisnigri*, Europe, east to Ukraine, and accidentally introduced in North America and South America (Blackman and Eastop 1984).

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